Pathological and Immunotoxicogical Studies on Some Heavy Metals in Rats

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Abstract

Vanadium obviously has the potential to affect many areas in the body for better or worse. Vanadium exhibits biphasic effect, essentiality at low concentrations and toxicity at high doses. Recent studies on vanadium involve its insulin-like properties and its possible role in treating diabetes. However, the toxicity associated with vanadium limits its application. Since the pathogenesis of vanadium-induced toxicities mainly involve free radicals and lipid peroxidation and the hypothesis that the chelator might be more effective in removing vanadium from the body, we aimed to investigate the toxopathological effects of ammonium metavanadate in normal healthy rats and to assess if the vanadate-induced toxicity could be reversed by treatment with tiron, sodium 4,5-dihydroxybenzene-1,3-disulfonate single or in combination with antioxidants (se and vit E) through histopathological examination of liver, kidney, testes and epididymis by light microscope, histopathological examination of liver tissue by electron microscope, measurement of index of lipid peroxidation marker in serum (MDA) and antioxidant enzyme (SOD), measurement of serum testosterone level in adult albino rats and evaluation of the therapeutic efficacy or possible protection of tiron single or in combination with antioxidants (se and vit E) against vanadium-induced toxicity. 104 male rats were divided into 7 experimental groups: GI control GII ammonium metavanadate (V) at (5.62 mg/kg) dissolved in 0.2 ml distilled water orally intragastric daily for 8 weeks. GIII, GIV, GV, GVI, GVII received (V) as in group II and were taken tiron (314 mg/kg), selenium (0.5 mg/kg), vit E (50 mg/kg), tiron plus selenium, tiron plus vit E respectively. Body weight of animals was recorded at day of sacrifice every 2w after 2w, 4w, 6w and 8w. Collectively, the results indicate that vanadium led to a statistically significant decrease in body weight gain, decrease in testosterone level, decrease in antioxidant enzymes (SOD) and increase of lipid peroxidation index, (MDA) level. Histopathological lesions in examined tissues and its progressive damaging effect confirmed the results of blood parameters and increase in severity in time-dependent manner. These results indicate that the toxic effects of vanadium are cumulative and the damage in tissues is time-dependent. The altered level of these blood parameters and histopathological examination were significantly restored with combination therapy by chelating agent (tiron) plus antioxidants either (vit. E) or (se) whereas other treatments as chelation therapy (V+T) alone or antioxidant therapy (V+vit.E) or (V+Se) alone were not effective at this level in comparison with combination therapy. Our findings regarding the efficacy of combination therapy should be confirmed in more experiments. This preliminary study does not provide all answers to the magnitude of the efficiency of chelating agents in vanadium toxicity, and thus, further research is warranted.

Keywords: vanadium – histopathology – blood parameters- antioxidants – vitamin E-selenium- chelating agent – tiron.
References


